

DOE Better Buildings Alliance

Advanced RTU Controller Specification

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Technology Description

An advanced rooftop unit (RTU) controller is a retrofit technology that provides enhanced functionality and energy savings opportunities for existing RTUs. Estimates and preliminary results from field tests indicate 15% to over 50% energy savings with a 1-4 year simple payback potential.^{1, 2}

There are several features of the advanced RTU controllers that contribute to the savings; however, most of the savings come from the implementation of variable or multi-speed control of the supply air fan, demand controlled ventilation, and improved economizer control. Some of these technologies have additional features for demand response, web-based remote monitoring, and automated fault detection and diagnostics. With regard to energy savings, the essential and highly desirable features are listed below.

Essential features:

- Multi-speed or variable speed supply fan control with, at a minimum, reduced fan speed operation for first stage cooling and ventilation modes
- Modulating outdoor air damper control to maintain proper ventilation rates according to ASHRAE Standard 62.1 under different fan speeds

Highly desirable features:

- Demand controlled ventilation
- Integrated economizer control
- Remote monitoring and control
- Automated fault detection and diagnostic capabilities
- Economizer control with differential dry-bulb and dew-point lockout
- Demand response or demand management

Additional features:

- Advanced thermostat control:
 - o Optimum start
 - o Predictive cooling with smart economizer control
- Condenser fan control
- Compressor variable capacity control

¹ Pacific Northwest National Laboratory, [Advanced Rooftop Control \(ARC\) Retrofit: Field-Test Results](#), July 2013.

² National Renewable Energy Laboratory, [Advanced Rooftop Unit Control Retrofit Kit Field Demonstration: Hawaii and Guam Energy Improvement Technology Demonstration Project](#), April 2014.

Best Applications for Advanced RTU Controllers

Advanced RTU controllers will have the best performance under the following conditions:

- Existing RTU
 - constant speed supply fan operation
 - greater than 7.5 tons (evaporator fan ≥ 2 hp)
 - at least 5 years of remaining life
- Existing building
 - more than 50 hours per week of operation
 - high electricity rates (over 0.10 \$/kWh blended rate)
 - located in a climate with significant swing seasons